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October 06, 2005

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APPLICATION NUMBER: *60/608,849*
FILING DATE: *September 10, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/29870*

Certified by

Jon W. Dudas

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PTO/SB/16 (5-03)
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Nilesh	Patel	Irvine, California

☐ *Additional inventors are being named on the____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

FLUID COUPLING ASSEMBLY WITH INTEGRAL RETENTION MECHANISM

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 7 ☐ CD(s), Number

☒ Drawing(s) *Number of Sheets* 13 ☐ Other (specify)

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

		FILING FEE AMOUNT ($)
☒	Applicant claims small entity status. See 37 CFR 1.27.	
☐	A check or money order is enclosed to cover the filing fees	
☒	The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 19-2814	$80.00
☐	Payment by credit card. Form PTO-2038 is attached.	

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE

TYPED or PRINTED NAME Joseph W. Price

TELEPHONE 949-253-4920

Date 9/10/04

REGISTRATION NO. *(if appropriate)* 25,124

Docket Number: 42716-1800

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PATENT APPLICATION

42716-1800

FLUID COUPLING ASSEMBLY WITH INTEGRAL RETENTION MECHANISM

Nilesh C. Patel

FLUID COUPLING ASSEMBLY WITH INTEGRAL RETENTION MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention.

[0001]

The present invention is directed to a coupling joint assembly for retaining a sealed joint for fastening two components together and more particularly to an improved fluid coupling assembly that can be scaled to maintain its pre-lube characteristics for different size fluid paths.

2. Description of Related Art.

[0002]

The necessity to couple and uncouple fluid lines or conduits, for example, associated with aircraft engines has been recognized in the prior art. Such coupling assemblies require a high degree of reliability to maintain a mechanical coupling of two component parts during use while subject to a substantial application of temperature ranges, stress vibration and movement. These factors can cause both a loosening and releasing of a desired seal ceding torque between a pair of interfacing components. In general, coupling two component parts together has frequently utilized the respective threads in a nut and bolt arrangement with the threads pre-loaded or torqued to a desired compression. To prevent a subsequent loosening of such a coupling joint, lock washers, interference thread fitting, tapered threading surfaces for providing interference, nut plates and lockwiring have been used.

[0003]

In the aircraft field wherein the fluid coupling assembly is utilized in pneumatic and hydraulic connectors, there is not only temperature, external vibrations and stress problems, but also pressure stresses from the fluid that is being conducted through the sealed joint can add additional problems.

[0004]

Because of the necessity to maintain a high degree of reliability, frequently lockwiring has been utilized so that visual inspection can affirm the integrity of the coupling joint assembly. An example of a lockwire fluid coupling can be found in U.S. Patent Number 3,702,707 and an alternative hydraulic connector can be seen in U.S. Patent Number 4,877,271.

[0005]

U.S. Patent Number 5,215,336 discloses a coupling joint assembly wherein one or more annular cantilevered projections can engage an annular serrated surface to enable a sealing pre-lubed force to be created during a sealing engagement and to provide a locking interaction during any disengagement.

[0006]

U.S. Patent Number 5,058,930 discloses a high pressure coupling with an anti-galling feature wherein a ramp with an annular groove engages a coupling member that rides up the ramp until protruding tips extend beyond the ramp and are accommodated in the annular groove.

[0007]

U.S. Patent Number 6,557,900 discloses a multi-component nut locking apparatus also with an annular cantilevered pawl for engaging racket teeth. The release mechanism can engage the pawl to facilitate decoupling of the parts.

[0008]

Finally, U.S. Patent Number 3,053,357 discloses of interest a captive nut with a bolt guiding means.

[0009]

There is still a need in the prior art such as in the aircraft field to provide a pair of lightweight fastening components that can form a locking assembly for a coupling joint with high reliability.

SUMMARY OF THE INVENTION

[0010]

The present invention is directed to an improved fluid coupling assembly for retaining a sealed joint by fastening two components together. One of the components includes a serrated annular surface. The other component has an axially aligned flexible projection to contact the serrated annular surface to enable a relatively low force rotation during a sealing engagement of a first sealing surface on the first component and a second sealing surface on the second component. A relatively higher force resistance is provided between the serrated annular surface and the axial flexible projection during a disengagement rotation to thereby ensure the security of the predetermined seating torque between the pair of components. The axially projecting members such as a cantilevered beam or a plurality of cantilevered beams can employ at least one tooth of the configuration having a surface of an inclination or disposition relative to the serrated annular surface to permit a lower force camming rotation in a first direction, but creating a higher force locking engagement in a second rotational direction. The respective components can be joined to fluid conduits and the coupling assembly can be connected to the respective ends of the fluid conduits to enable the creation of a predetermined compressive or torque force on a sealed joint. The first component is adapted to be connected to a first fluid conduit and to provide a first sealing surface with a series of annular serrations positioned at a predetermined offset location axially along the first component member. The first component member can have a first fastening configuration such as helical threads. A second component member is adapted to be connected to a second fluid conduit and can enable a second sealing surface to engage the first sealing surface of the first component member. A second fastening configuration such as complimentary threads can be provided on the second component member wherein a position of the respective threads forming the fastening configuration and the position of the second sealing surface can be axially predetermined to ensure the appropriate sealing compression or torque force.

[0011]

The second component member can have an annular cylinder axially extending with a plurality of distal slots cut therein to provide a plurality of a axially cantilevered beams. Each cantilevered beam has a curvilinear cross section and supports at least one tooth of a configuration to engage the series of annular serrations on the first component member. A series of serrations can, for example, be teeth having a camming face on one side of each tooth and a locking face on the other side of the tooth.

[0012]

The teeth on the axially cantilevered beams can have a complimentary sloping face on one side to facilitate a low force camming rotation during a sealing engagement. The other side of the teeth can be set at an angular relationship to provide a locking engagement and a relatively higher force resistance during any rotational disengagement.

[0013]

The first component member can have an approximately cylindrical configuration with a hull cylindrical axial bore with a male projection having helical threads for rotation within a hollow opening of the second component member that has interior complimentary helical threads for providing fastening between the two component parts. Adjacent to the annular serrations on the first component member can be a multi-flat facet surface forming in essence a nut configuration to assist in rotating the first component so that the sealing surface on the male projection can engage a second sealing surface provided, for example, on a ferrule-tube fitting that can be welded to one fluid conduit.

[0014]

The second component member which functions similar to a nut also can have a plurality of load bearing exterior facets to assist in the application of a tightening force. The size and location of the slots help determine the length of the cantilevered beams. The resilient flex of the cantilevered beams are also a function of the

thickness of the beam, the material that the beam **[is constructed from]** such as titanium, stainless steel, etc. The number of slots determine the width of the arc. The wider the arc of the beam, the more resistance can be applied.

[0015]

The location of the distal end of the cantilevered beams and the annular serrated teeth can be respectively positioned so that when the two components are rotated together into a sealing engagement, an alignment of the teeth and the serrations will provide a visual representation that the compressive or pre-torqued forces between the respective sealing surfaces have been provided. Additionally, any disengagement movement will permit an operator to determine that compressive forces have been compromised.

[0016]

In operation, a second component member is actually mounted over a compression tube such as a ferrule-tube fitting having a conical bearing surface. The compression tube is frequently attached by welding to a fluid conduit. The second component member can relatively rotate about the compression tube, while the other end of the compression tube is securely fastened to its fluid conduit. The first component member is axially moved relative to the second component member so that the male member is then inserted into the female opening of the second component member to initially engage the respective threads. The rotation of the second component member starts the sealing engagement. Only if the threads are preliminarily engaged as the respective sealing surfaces of the first component member and the second component member come into contact and the flexible axial projections on the second component member come into contact with the series of serrations to create both a vibrating tactile and audible indicator for determining that the locking coaction is being engaged and completing the sealing joint. By appropriately determining the number of serrated teeth and the position of the axial projection members will ensure a retention action between the axial projection members and the serrated teeth.

CLAIMS

What Is Claimed Is:

1. A fluid coupling assembly for retaining a sealed joint, comprising:

a first member adapted to be connected to a first fluid conduit and having a first sealing surface, a series of serrations and a first fastening configuration;

a second member adapted to be connected to a second fluid conduit, a second fastening configuration and enabling a second sealing surface to engage the first sealing surface,

the second member has a plurality of axially cantilevered beams, each beam having at least one tooth of a configuration to engage the series of serrations, an operative engagement of the tooth and serrations enables a relative low force rotation during a sealing engagement of the first sealing surface and the second sealing surface and a relatively higher force resistance to rotation during disengagement.

2. The fluid coupling assembly of Claim 1 wherein each cantilevered beam has a curvilinear cross section.

3. The fluid coupling assembly of Claim 2 wherein the cantilevered beams are spaced in an annular pattern with a pair of teeth provided at an axially distal side end of each cantilevered beam.

4. The fluid coupling assembly of Claim 1 wherein the serrations are annularly arranged in a circular pattern about the first member and the axially cantilevered beams have inner and outer diameters that subscribe concentric circles and at least one tooth member on each cantilevered beam projects radially inward from each cantilevered beam inner diameter to engage the circular serrations in a ratcheting manner as the respective teeth undulate over the circular serrations during sealing engagement and disengagement modes of operation.

5. The fluid coupling assembly of Claim 4 wherein a pair of spaced teeth project radially inward from each cantilevered beam.

6. The fluid coupling assembly of Claim 4 wherein the circular serrations are formed by truncated teeth with annular axially tapered surfaces and transverse engagement surfaces of different angular dimensions.

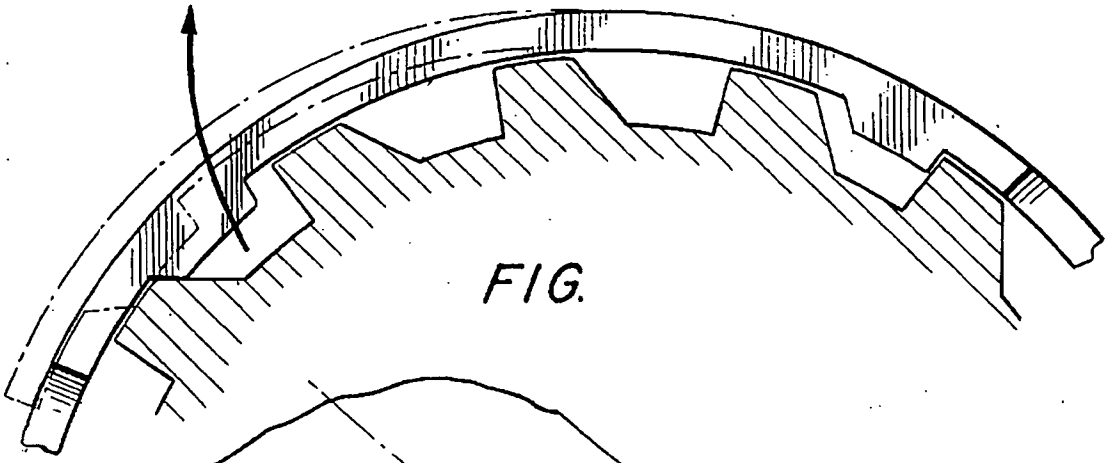


FIG.

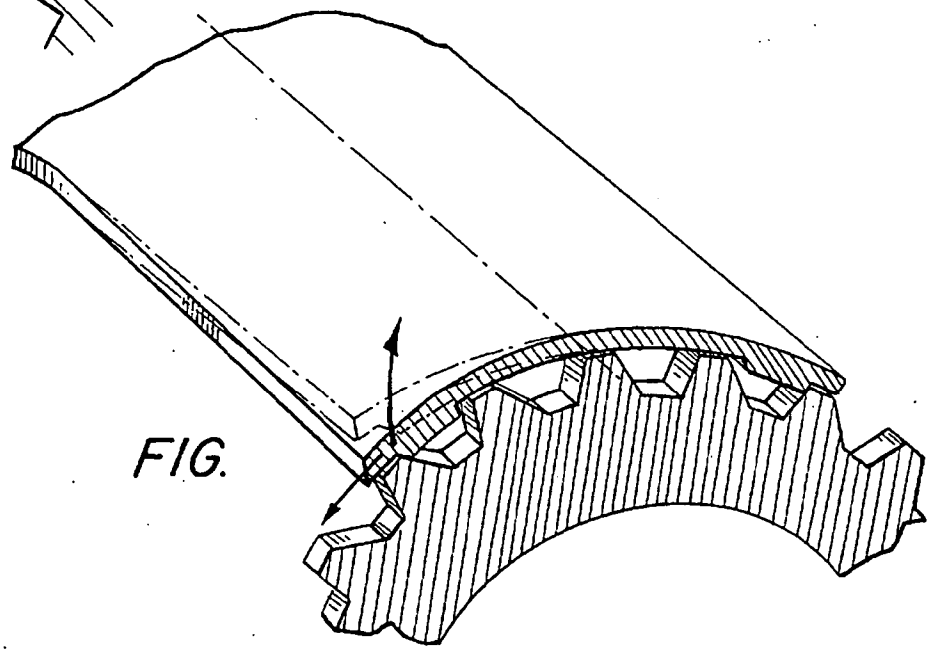


FIG.

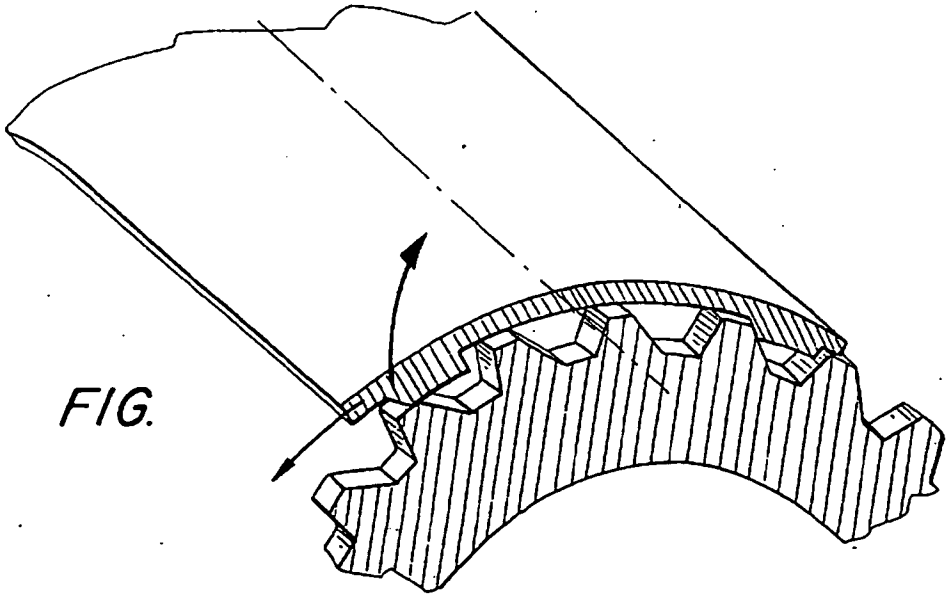
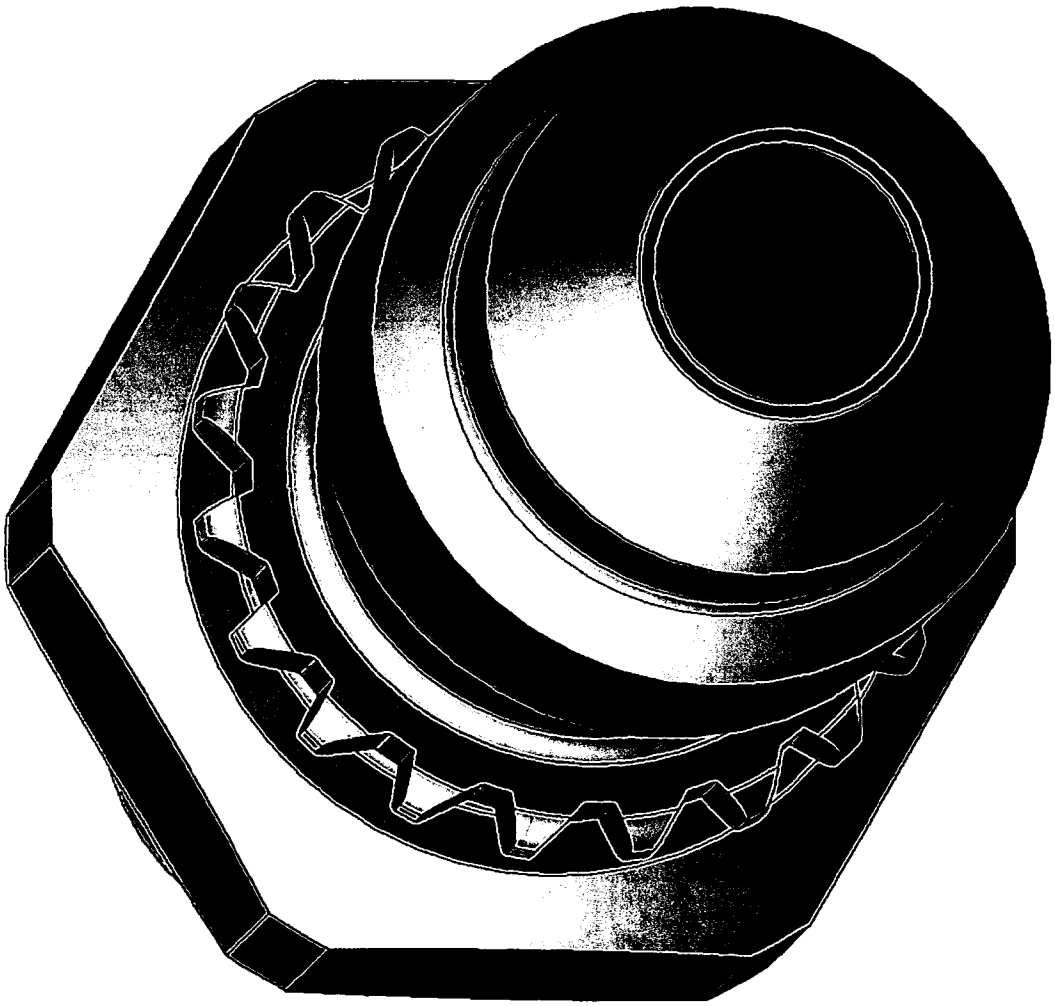


FIG.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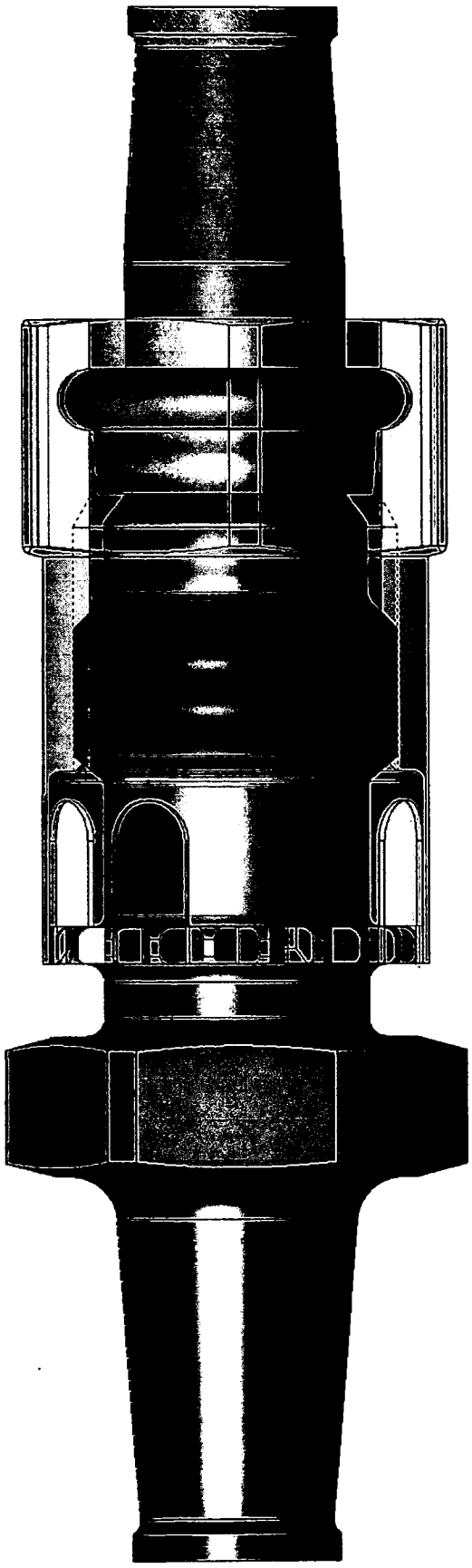
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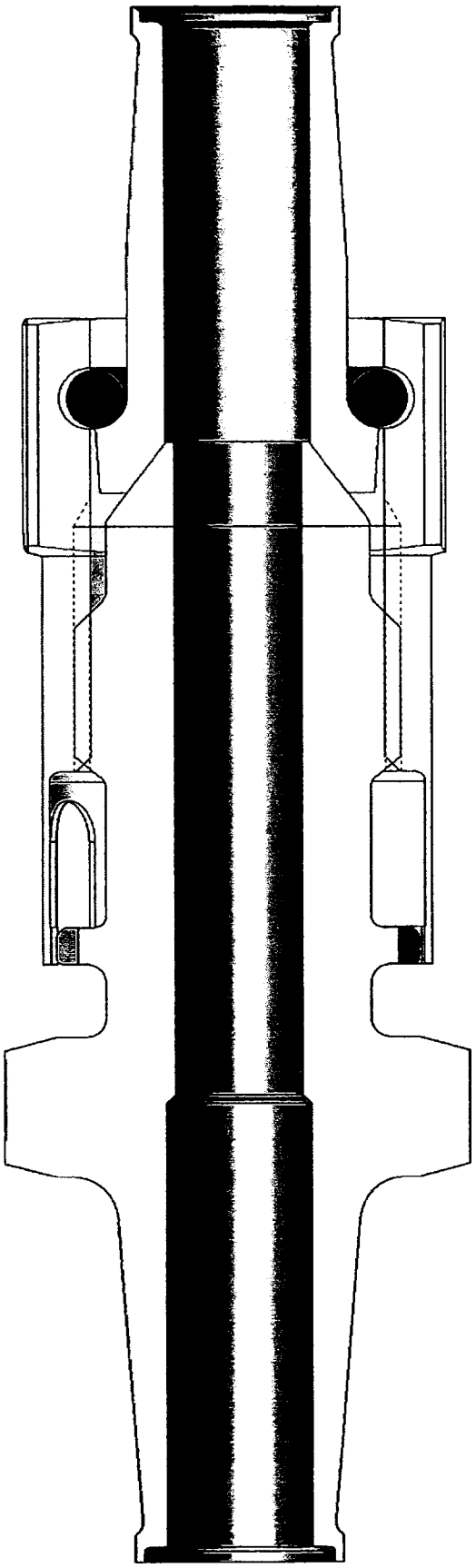
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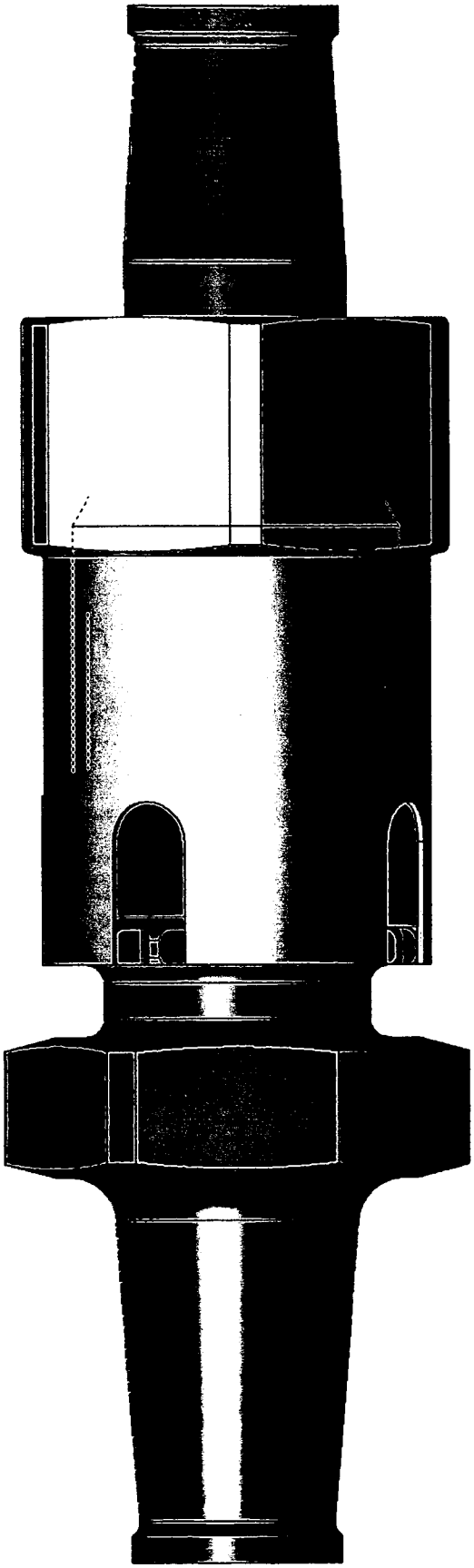

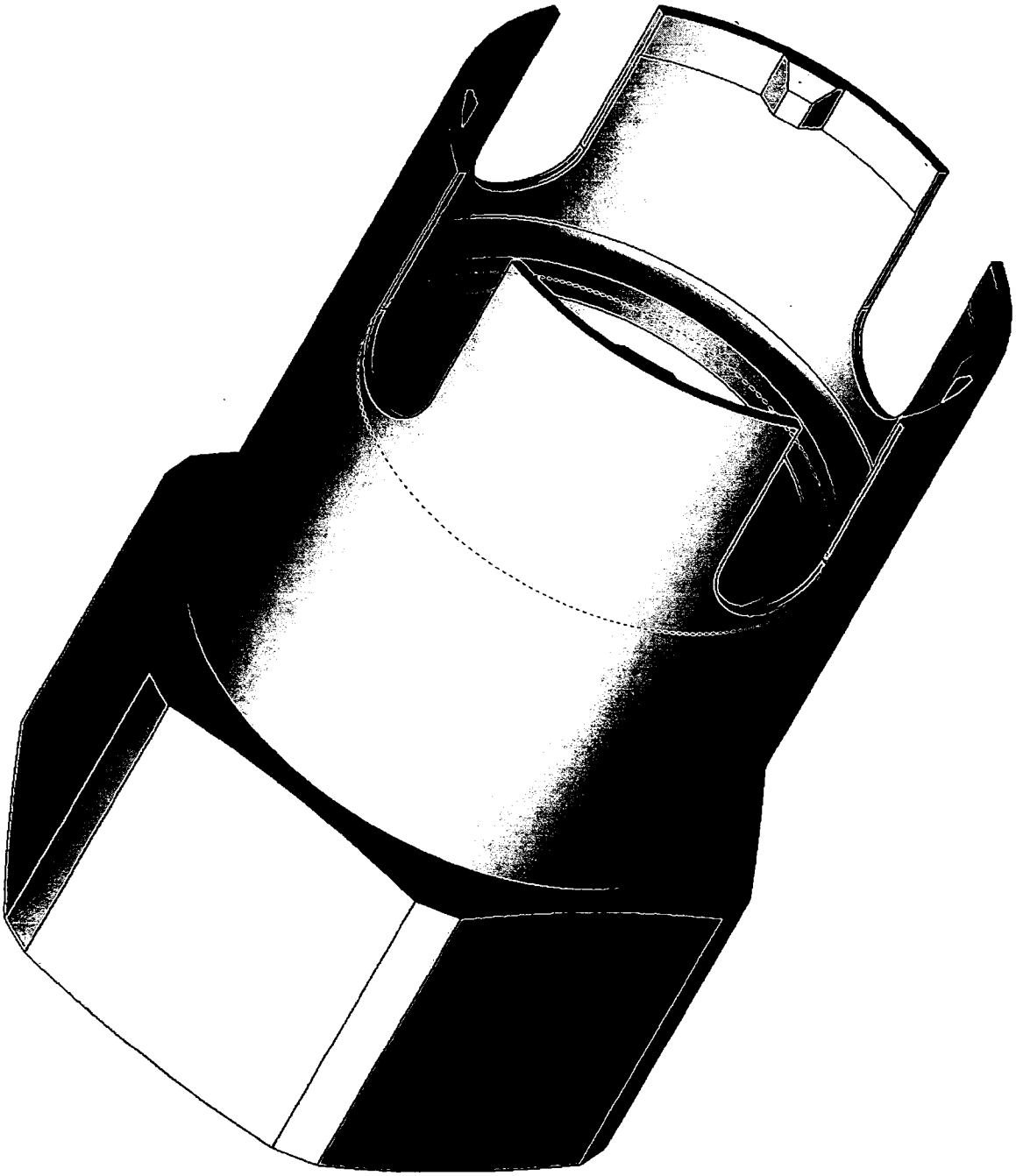

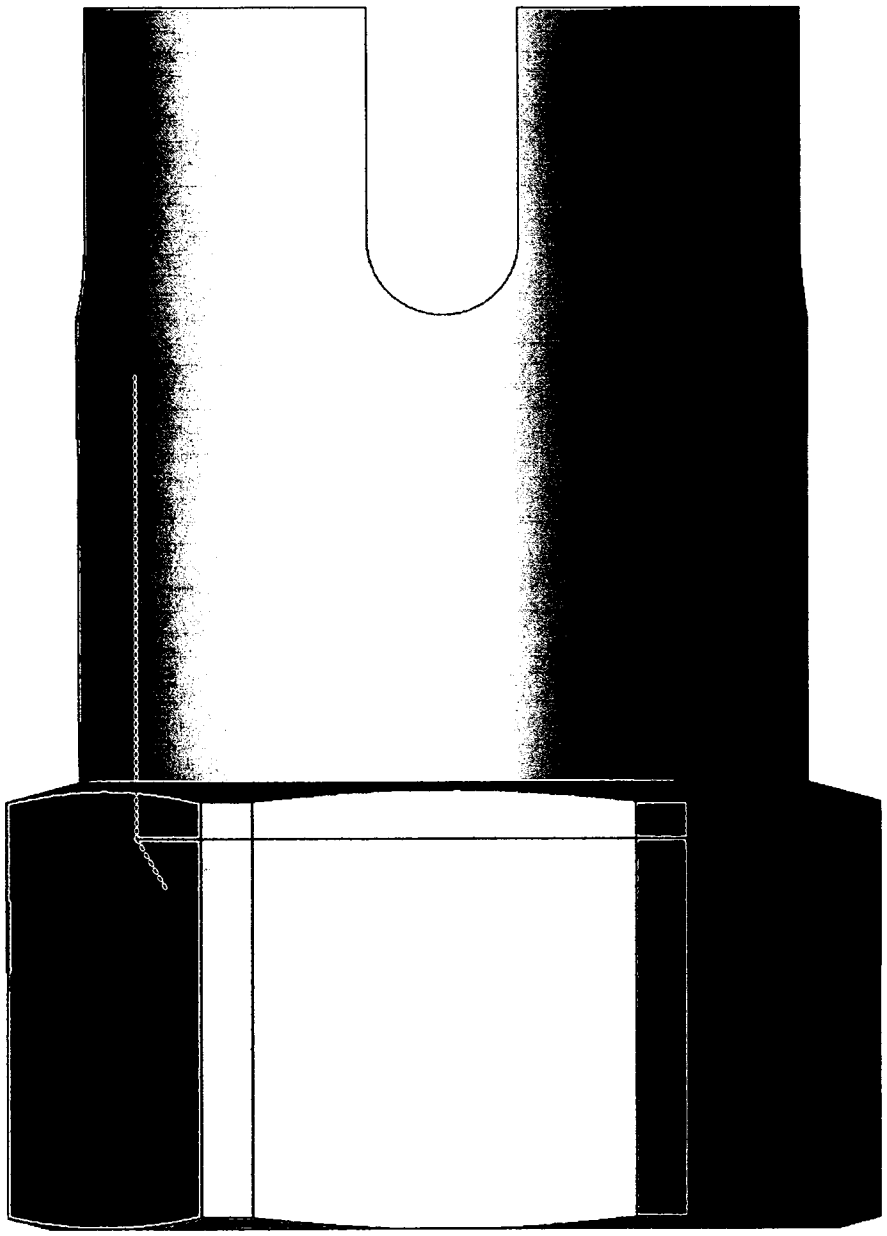

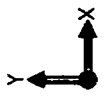
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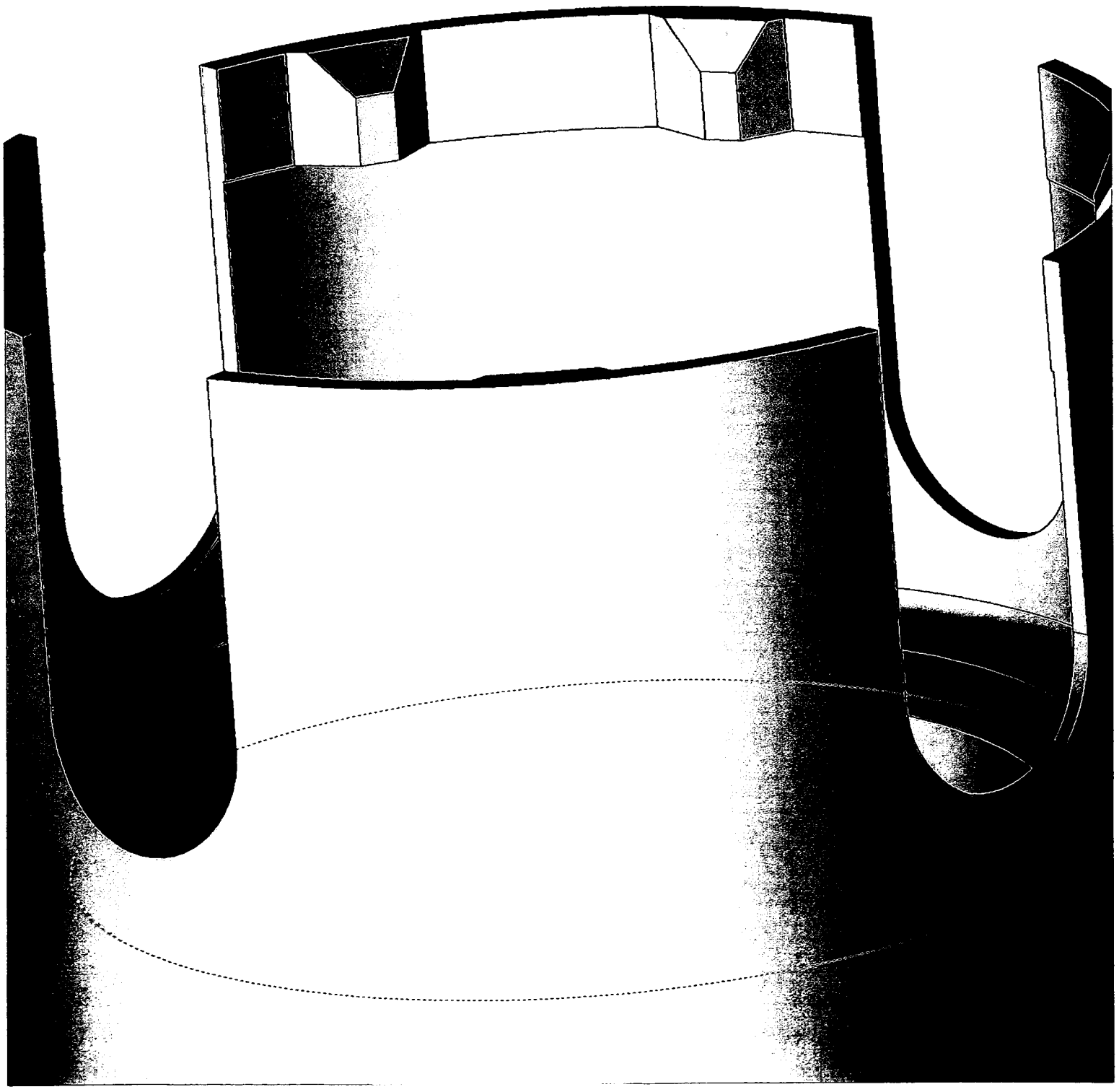
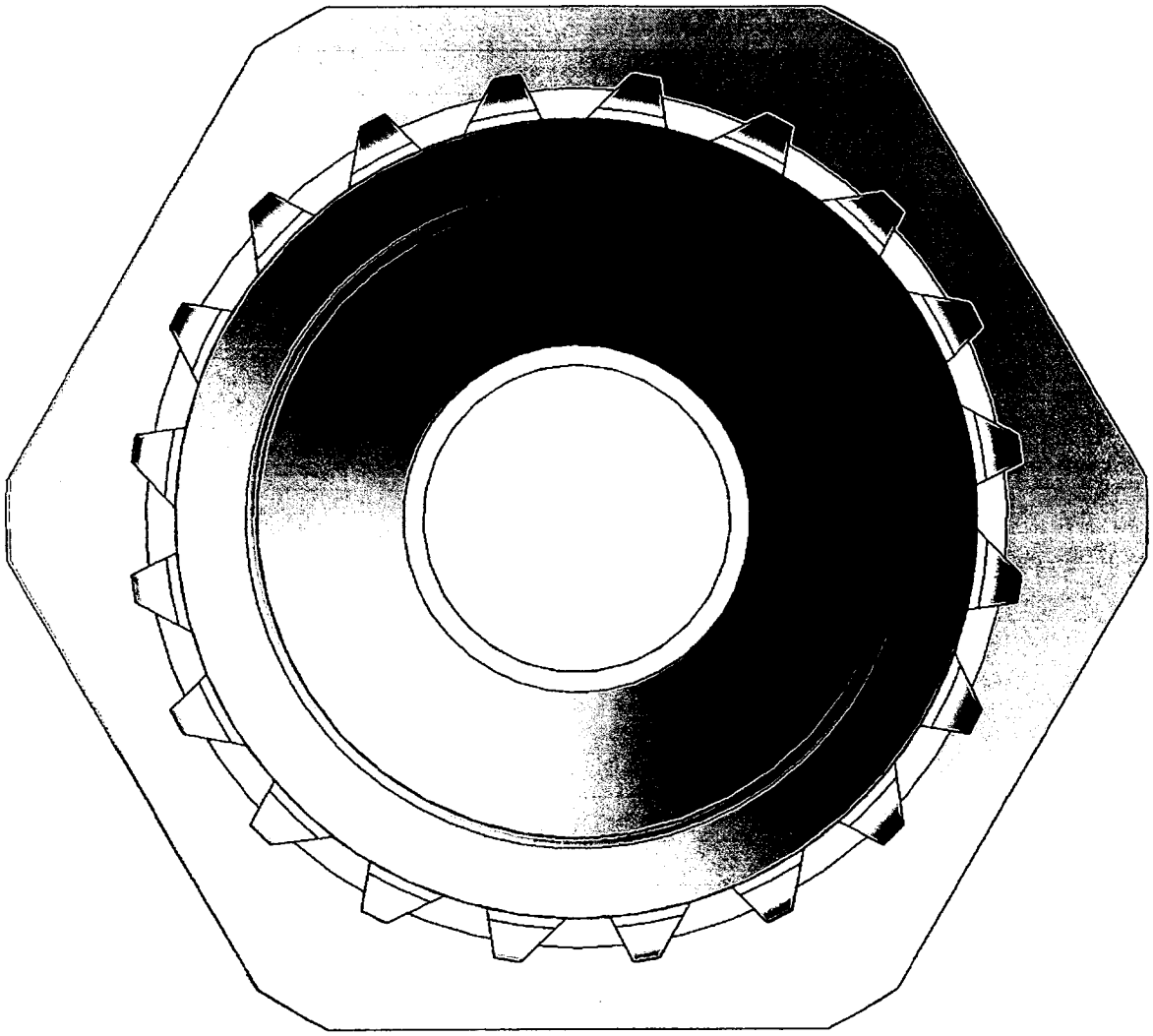
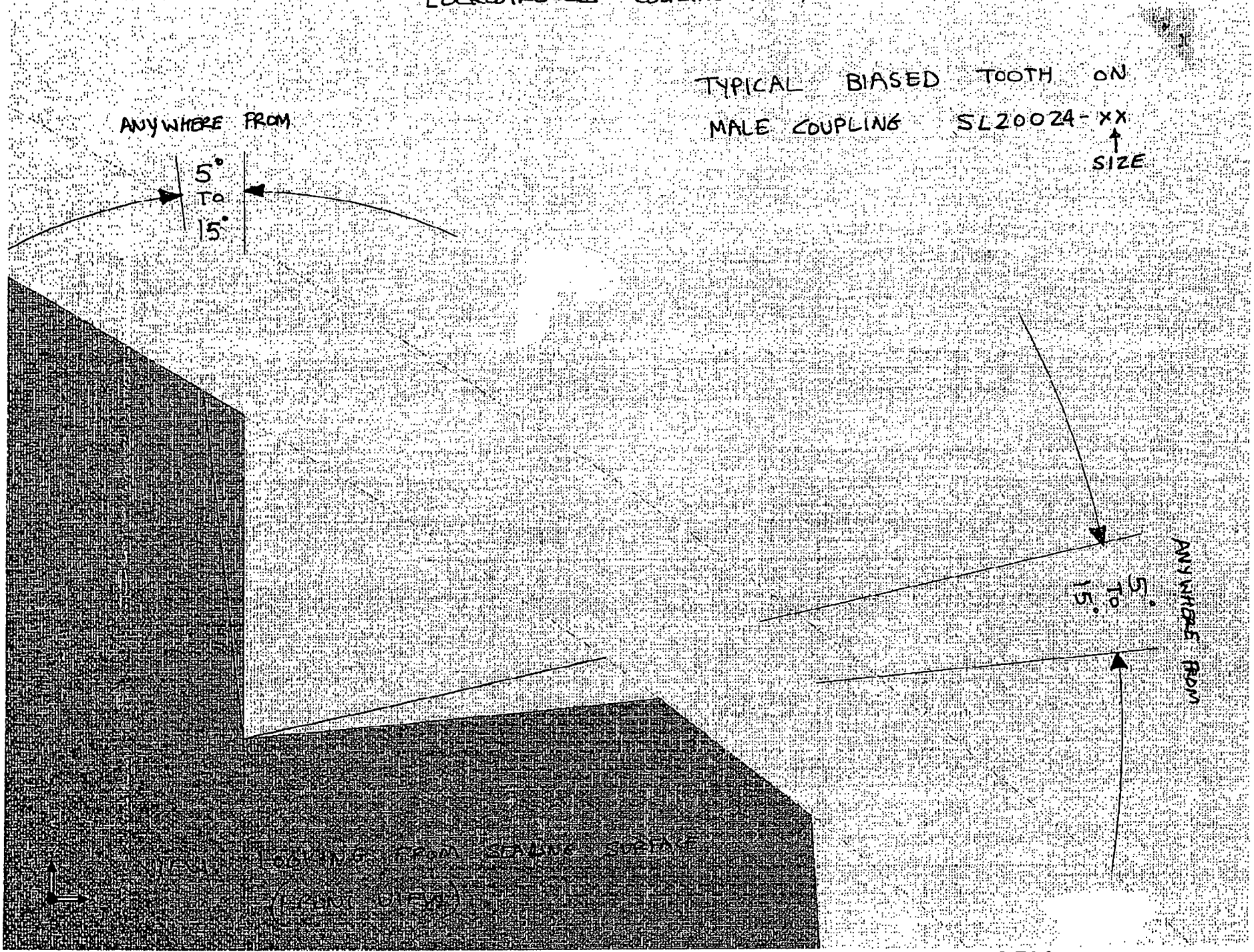
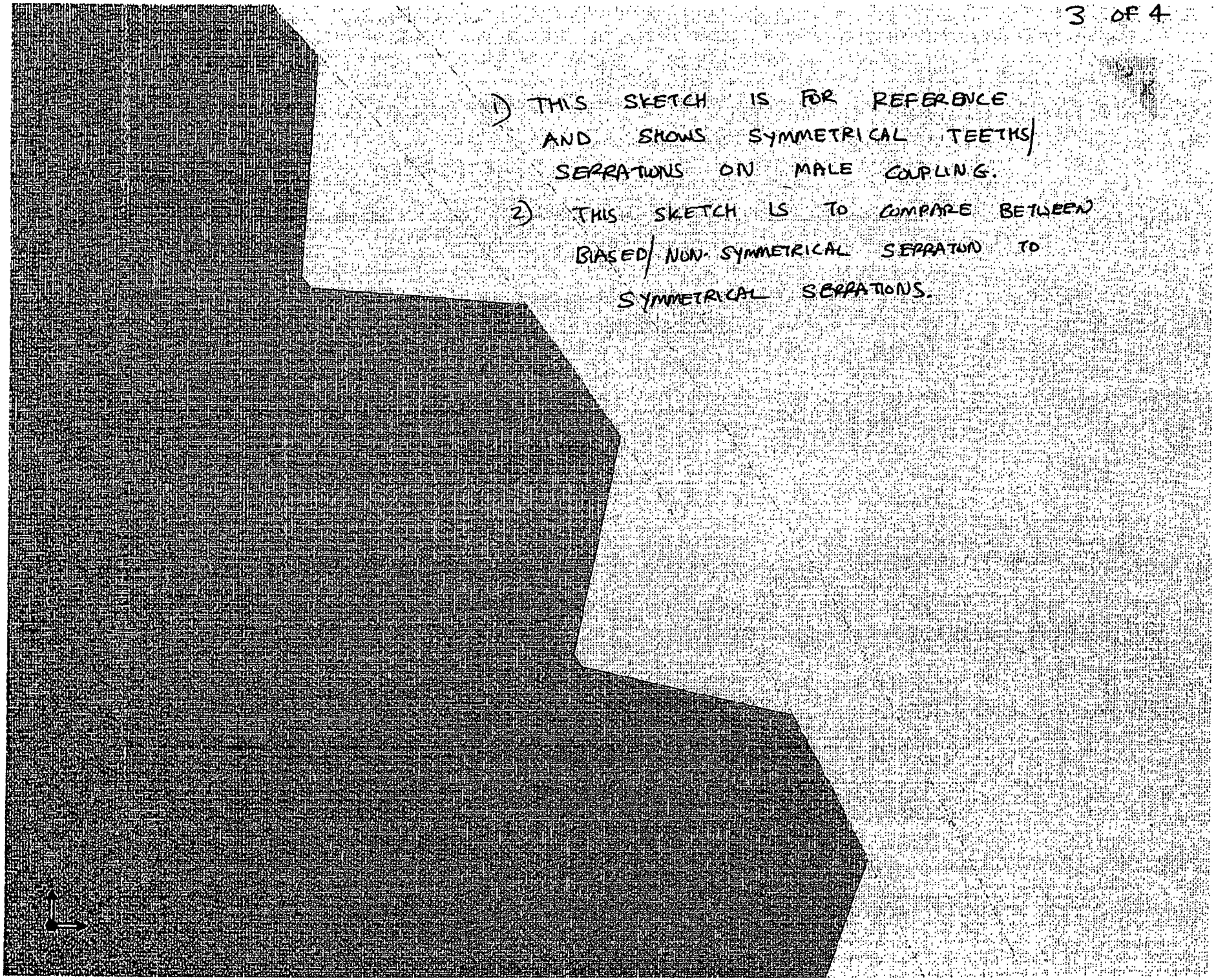



Y
Z

LOCKWIRELESS COUPLING ASSY

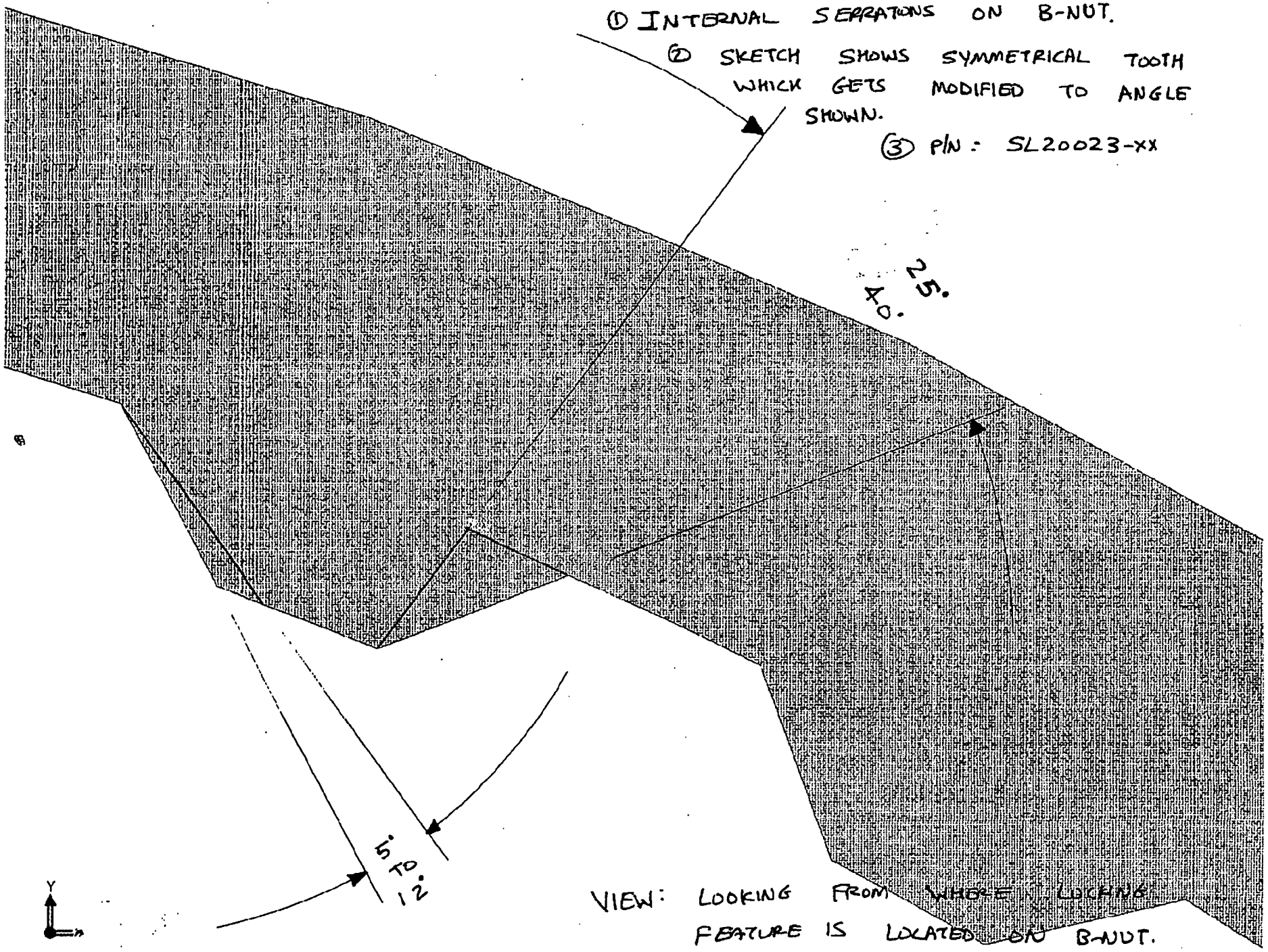
TYPICAL BIASED TOOTH ON MALE COUPLING SL20024-XX (SIZE)





1) THIS SKETCH IS FOR REFERENCE AND SHOWS SYMMETRICAL TEETHS/ SERRATIONS ON MALE COUPLING.

2) THIS SKETCH IS TO COMPARE BETWEEN BIASED/ NON-SYMMETRICAL SERRATION TO SYMMETRICAL SERRATIONS.



NOTES:

1. CUSTOMER: HAMILTON SUNDSTRAND, PRATT & WHITNEY.

2. MATERIAL : 6AI - 4V TITANIUM ALLOY PER AMS4928, AMS4965 OR AMS4967.

3. HEAT TREAT: 130 KSI UTS MIN .

4. FINISH: DOW CORNING 321 DRY FILM LUBRICANT PER PWA 36240 ON ALL INTERNAL AREAS, EXTERNAL AREAS OPTIONAL.

5. ASSEMBLY WEIGHT INCLUDES : COUPLING TUBE , AND NUT .

6. NUMBER OF SLOTS AND LOCATION OF TEETHS ON NUT MAY VARY FROM ONE SIZE TO ANOTHER.

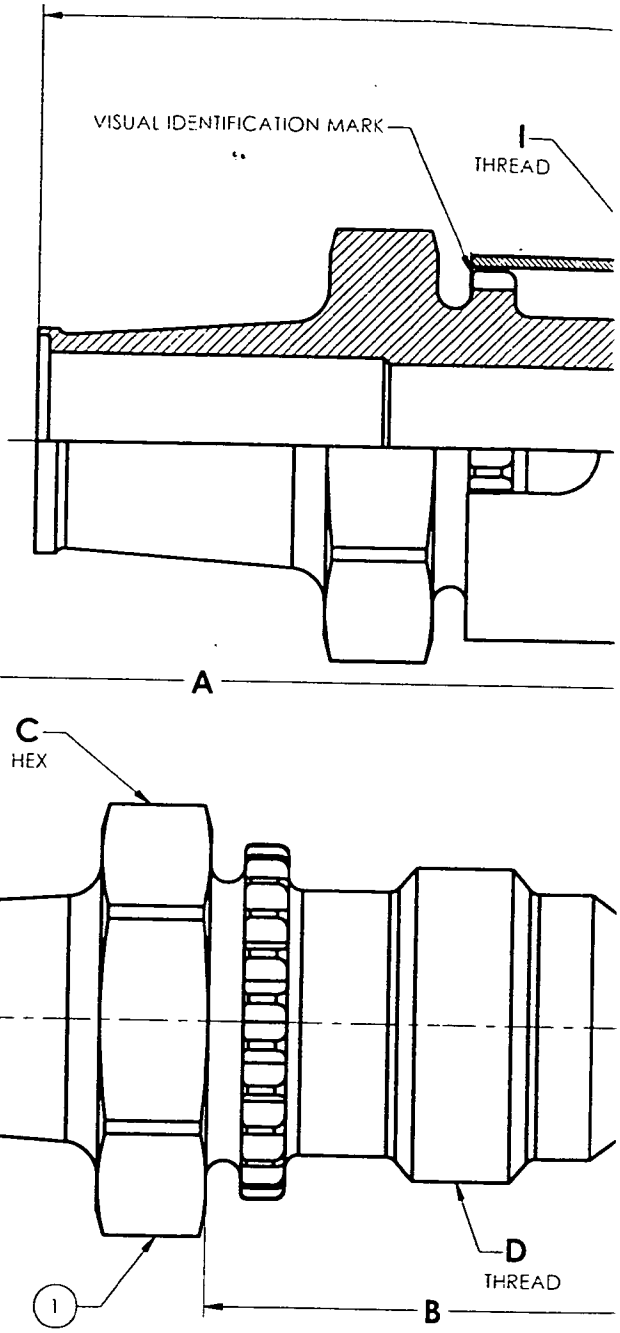
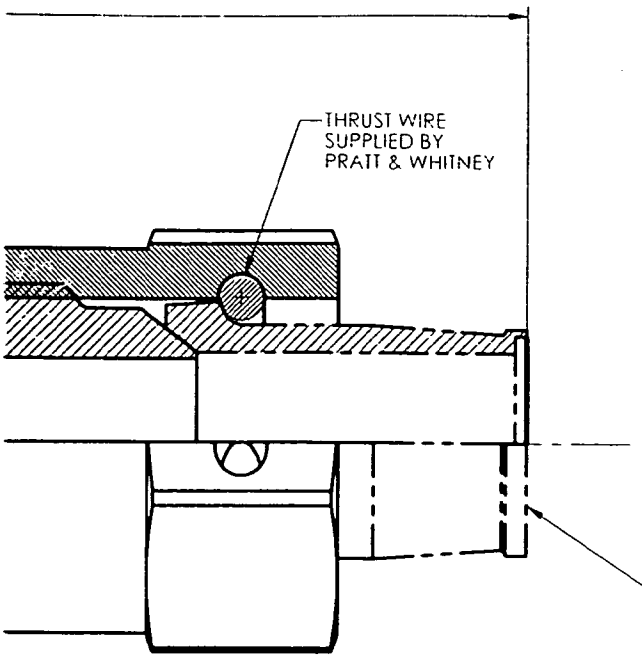


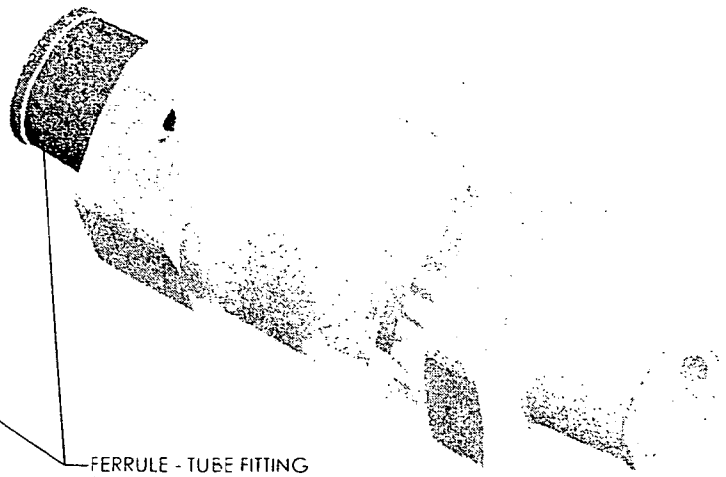
TABLE I

SHUR-LOK SL20022 DASH No	TUBE OD	ASSEMBLY TORQUE LB - in	COUPLING - TUBE					NUT				
			SHUR-LOK PART No	A	B	C HEX	D THREAD PER MIL-S-8879	SHUR-LOK PART No	E MAX	G HEX MAX	H	P
04	.250	65 - 75	SL20024-04	1.520 1.500	.801	.553 - .564	.4375-20UNJF-3A	SL20023-04	.880	.553 - .564	.320	
06	.375	130 - 140	SL20024-06	1.505 1.485	.786	.679 - .690	.5625-18UNJF-3A	SL20023-06	.950	.679 - .690	.350	
08	.500	340 - 375	SL20024-08	1.618 1.608	.904	.865 - .880	.750- 16UNJF-3A	SL20023-08	1.080	.865 - .880	.400	
10	.625	475 - 525	SL20024-10	1.750 1.740	1.036	.990 - 1.000	.875- 14UNJF-3A	SL20023-10	1.280	.990 - 1.000	.420	
12	.750	675 - 750	SL20024-12	1.861 1.851	1.147	1.239 - 1.250	1.0625-12UNJ-3A	SL20023-12	1.380	1.239 - 1.250	.450	
16	1.000	950 - 1050	SL20024-16	1.978 1.968	1.264	1.489 - 1.502	1.3125- 12UNJ-3A	SL20023-16	1.440	1.489 - 1.500	.500	

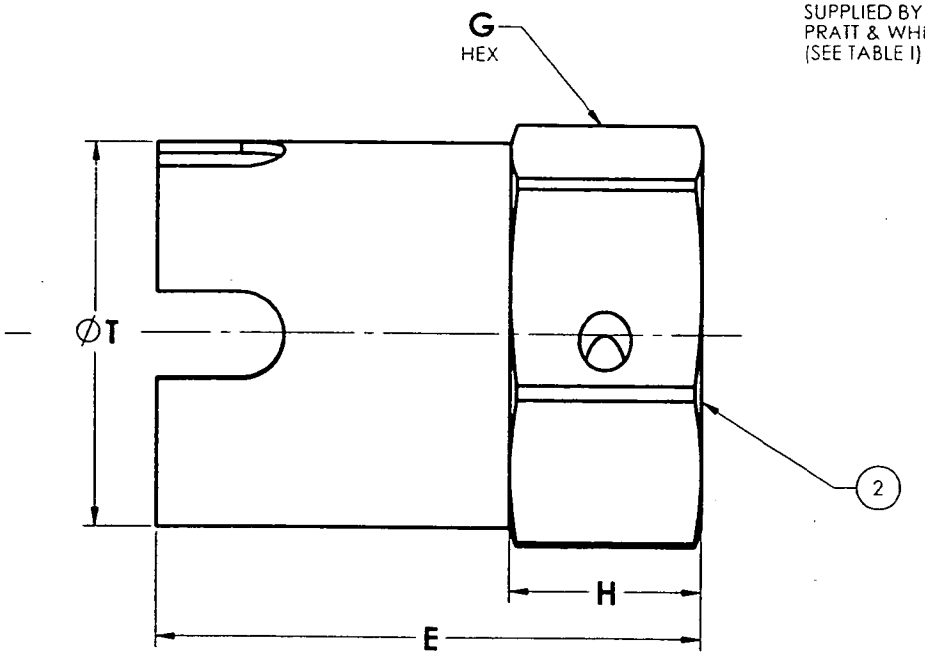
SALES REV NC

REVISIONS						
LTR	ECN NO	DATE	DRAWN	CHKED	APPD	REL
NC	20432	SALES RELEASE				





FERRULE - TUBE FITTING
SUPPLIED BY
PRATT & WHITNEY OR SLC
(SEE TABLE I)



BEST AVAILABLE COPY

DATE ISSUED: **30JULY04**

PRELIMINARY DRAWING
FOR CUSTOMER REVIEW

CUSTOMER: _____
SIGNATURE: _____
TITLE: _____

SHUR-LOK N.PATEL
ENG: _____
MFG: _____
QA: _____

THREAD L-S-8879	ØT MAX	U REF	WEIGHT LB/ EA ASSEMBLY APPROX. 5	FERRULE P & W PART NO (REF)
20UNJF-3B	.530	2.096	.039	ST2110-04
18UNJF-3B	.690	2.085	.050	ST2110-06
16UNJF-3B	.880	2.222	TBA	ST2110-08
14UNJF-3B	1.000	2.197	TBA	ST2090-10
12UNJ-3B	1.250	2.297	TBA	ST2090-12
12UNJ-3B	1.500	2.491	TBA	ST2090-16

QTY REQD	PART NO	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	HEAT TREAT	FINISH	ITEM NO
1	SL20023	NUT	2		3	4	2
1	SL20024	COUPLING-TUBE	2		3	~	1

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED
DRAWING INTERPRETATION PER CCM4012
WORKMANSHIP PRACTICES PER WA1005
ALL DIMENSIONS APPLY AFTER PLATING AND PRIOR TO THE ADDITION OF SOLID FILM LUBRICANT
BREAK ALL SHARP EDGES .02 [0.5] MAX
ALL FILLET RADII .020 [0.51] MAX.
125 [3.2]
ALL SURFACES
TOLERANCES
DIMENSION IN [ ] ARE MILLIMETERS

	SIGNATURE	DATE
DRAWN	JNGHEN	30APR04
CHECKED		
APPROVED		
MFG		
QA	XXXX	XXXX
ESR NO		

SHUR-LOK CORPORATION
IRVINE, CALIFORNIA

TITLE
COUPLING ASSEMBLY,
LOCKWIRELESS-SERRATED, 37° CONE SEAT

DRAWING NO **SL20022** REV **NC**

SCALE NONE | SIZE D | CAGE NO 97393 | SHEET 1 OF 1

SALES DRAWING
SOLIDWORKS DWG

NEXT ASSY

PF0208-070

240?_005